Observed sea level changes at different site from retracked altimetry over 2002-present

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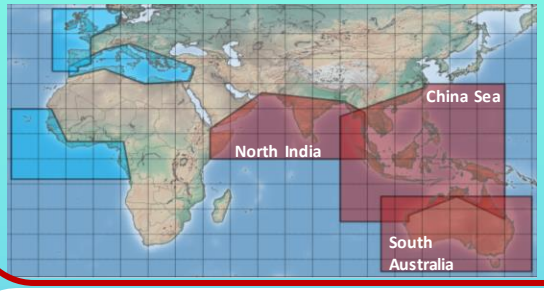
Summary: Here we present novel results of coastal sea level rise over 2002-2018 based on dedicated reprocessing of nadir altimetry data of the Jason-1, Jason-2 and Jason-3 missions performed in the context of the ESA Climate Change Initiative project. We computed high-resolution (20 Hz) along-track sea level time series as close as possible to the coast applying the Adaptative Leading Edge Subwaveform (ALES) retracker to radar echoes and using the Xtrack processing system developed at LEGOS. In this context, coastal sea level trends are computed. In this presentation, we show some examples of coastal sea level trends in 3 new regions: northern Indian Ocean, Australia and China sea. From these results, it appears that specific behaviour of sea level trends are visible approaching the coast, which has already been highlighted for previous regions. After thorough examination of the time series and severe editing, we observe in a number of cases an increase or a decrease of coastal sea level within about 5 km from the coast, compared to offshore. However in many cases, we also observe that coastal trends are the same as offshore.

CCI + Sea Level project:
6 regions considered combining Jason missions (J-1, J-2 & J-3)

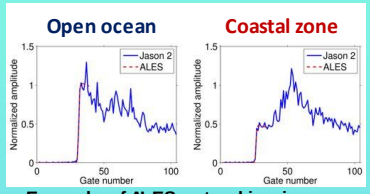


Method:

1. Reprocessing of Jason-1, Jason-2, and Jason-3 data by combining the ALES (Adaptative Leading Edge Subwaveform) retracking of radar Waveforms (Passaro et al., 2018) with improved X-TRACK geophysical corrections (Birol et al., 2017)

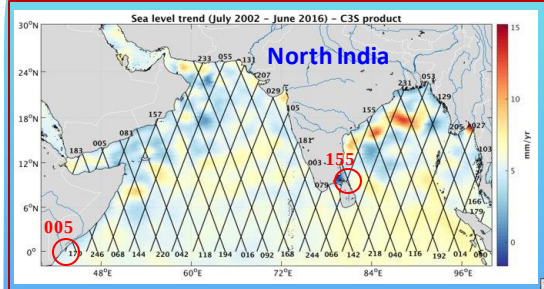
2. Use of 20-Hz along-track reprocessed data monthly averaged over June 2002 to May 2018

3. Computation of sea level trends from open ocean to coast at successive 20 Hz points as a function of distance to coast (Marti et al., 2019)

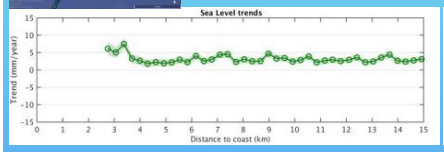


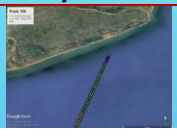
Exemple of ALES retracking in open ocean and in coastal zone

Coastal sea level trends (2002-2018) from retracked Jason-1,2&3 altimetry: a few examples

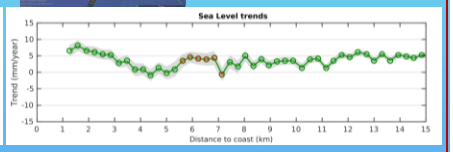


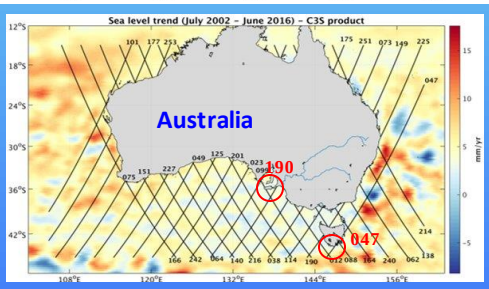
Track 155
Sri Lanka

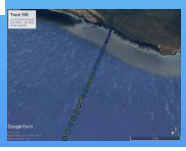




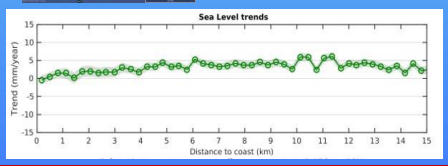
Track 005
Somalia

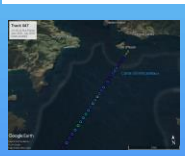




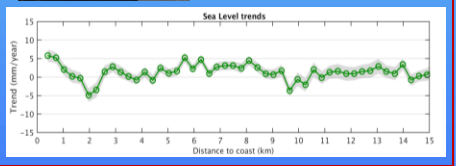


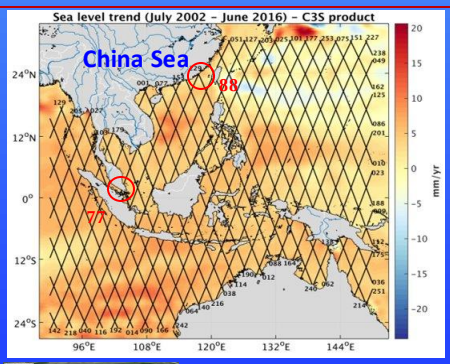
Track 190
South Australia



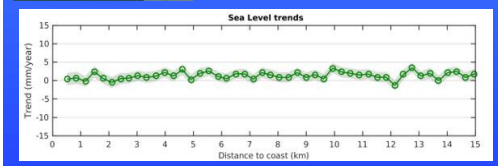


Track 47
South East Australia

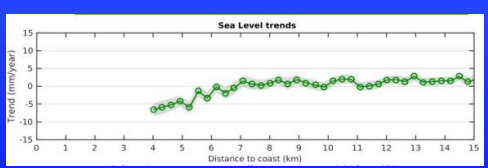




Track 88
South China



Track 77
Indonesia



Conclusions:

- Applying the ALES retracker combined with the X-TRACK processing system to 20-Hz sea level data from Jason missions, allows retrieving valid data very close to the coast (up to less than 1 km in some cases) and compute robust sea level trends.

-In some instances, sea level trends near the coast (<5-8 km) differ significantly from more distant trends (>8km)

- Physical processes localized at the coast may cause such trend behaviors. (coastal currents, river discharge, ...)

References: Passaro et al., Validation of a global dataset based on subwaveform retracking: improving the precision of pulse-limited satellite altimetry; 11th Coastal Altimetry Workshop, Frascati (ESA-ESRIN), Italy, 2018-06-15, 2018; Birol et al., Coastal applications from nadir altimetry: example of the X-TRACK regional products. Advances in Space Research, 10.1016/j.asr.2016.11.005, 2017; Marti et al., Sea level change from satellite altimetry over 2002-2016 along the coasts of Western Africa, ,Advances Space Research, published online 24 May 2019; Gouzenes et al., Coastal sea level change at Senetosa, submitted, 2020.